Improving Student Feedback Literacy Through Collaborative Dialogic Feedback intervention: An Action Research study at a University in Southwest China

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Abstract

Background and Aim: Student feedback literacy (SFL), a group of cognitive and dispositional competencies for students to benefit from feedback, has been viewed as a key part of lifelong learning capacity. At a university in Southwest China, students and teachers reported low levels of SFL and the absence of feedback practices for cultivating SFL. The action research aims to testify to the efficacy of integrating collaborative dialogic feedback (CDF) intervention into a university course curriculum to improve SFL.

Materials and Methods: A quasi-experimental study was conducted with 76 sophomore students from a university in southwest China majoring in business English. Three rounds of collaborative dialogic feedback intervention were conducted in the experimental group (N=37), and teacher-dominated feedback was conducted in the control group (*N*=39). Data were collected over a 16-week semester, including the pre- and post-intervention student questionnaires of both groups, five types of student feedback documents, and post-intervention interviews of nine informants from the experimental groups.

Results: The quantitative data showed that students from the experimental group perceived significant improvement in appreciation of and readiness to engage in feedback, and eliciting, generating, processing, and enacting feedback information, with a p-value of the results of the Wilcoxon signed-rank test less than 0.05, and students from the control group perceived no improvement. The content analysis of the student feedback document demonstrated a gradual improvement in the behaviors related to the six dimensions of feedback literacy during the eight feedback activities of the intervention. In the interviews, students attributed their improvement in feedback literacy to sufficient teacher support, opportunities for ongoing practices, and experiences of benefiting from being the key agent of feedback available in the collaborative dialogic feedback intervention.

Conclusion: The results of both quantitative and qualitative data support that the collaborative dialogic feedback intervention could facilitate the development of student feedback literacy.

Keywords: Student Feedback Literacy; Dialogic Feedback; Collaborative Dialogic Feedback

Introduction

In the era of rapid technological advancement and ubiquitous accessibility of learning resources, developing lifelong learning ability has become an essential need of individuals and a central aim of higher education. An essential set of lifelong learning skills for academic and professional success is engaging in and maximizing the benefits of feedback processes by seeking, generating, processing, and using feedback information effectively (Winstone et al., 2022). These capabilities are conceptualized as student feedback literacy (SFL) (Carless & Boud, 2018; Molloy et al., 2020). As the university sector plays an essential role in cultivating lifelong learning and professional expertise, how to embed the cultivation of SFL into the curricula of the university has gained growing attention from both researchers and educators (Malecka et al., 2020). Recent years, feedback research has testified the efficacy of various feedback-related strategies on the development of SFL in university, including feedback scaffolding (Tam, 2021), students' writing rebuttal to teachers' comments (Man et al., 2021), peer dialogic feedback (María & Annette, 2022; Reddy et al., 2020; Zhu & Carless, 2018; Zhu & To, 2021), whole-class feedback sessions involving instructors and peers (To & Liu, 2018; Zhan, 2019).

However, these attempts underscore the urgent need for systematically organized feedback practices to support the cultivation of SFL. On the one hand, with the popular belief that feedback is a teacher-dominated transmission of evaluative and corrective information and attention to assessment grades among

students, students lack both the willingness to develop SFL by engaging in feedback as proactive agents (Tam, 2021; To & Liu, 2018; Zhan, 2019). On the other hand, as the existing studies demonstrate that different feedback activities can have a beneficial effect on the development of different aspects of SFL, integrating these activities into an iterative, multistage, and multi-source feedback process is necessary for the development of the multifaceted SFL (Han & Xu, 2019). Although there were a few existing attempts at comprehensive feedback interventions, they were conducted in postgraduate academic writing courses (Ducasse & Hill, 2019; Han & Xu, 2019; Zhang & Mao, 2023). Therefore, embedding the overall development of SFL into the curriculum of higher education calls for further academic and practical efforts to establish a systematically organized feedback intervention.

In a university in Southwest China, the author's long-term observation and interviews with students and teachers, as the preliminary investigation of the study, echoed the problems revealed in the existing studies. Students at the focal university reported that they generally believe themselves to be passive recipients of feedback information, seldom solicit comments or suggestions from others without being required, especially from peers, and frequently experience difficulties in understanding feedback information. The faculty at the focal university indicated that their feedback conceptions, repertoire of feedback-related pedagogical strategies, and some structural barriers limited the design and implementation of a feedback intervention aimed at developing student feedback competence.

Objectives

This research article presents an action research study in which a collaborative dialogic feedback intervention was designed, implemented, and refined to support students' feedback literacy in the Chinese tertiary context. Through a quasi-experiment in an authentic classroom setting, the mixed-methods study aims to achieve four research objectives: 1) to determine the differences in the levels of SFL between the pre- and post-feedback intervention stages; 2) to investigate the process of change in students' SFL during the feedback intervention; 3) to explain why the focal students' SFL changed during the feedback intervention; 4) to propose a multistage and multisource feedback framework to improve SFL. The study extends our knowledge of the development of SFL and provides pedagogical guidance for feedback design and implementation for the development of SFL.

Literature review

Student Feedback Literacy

SFL is conceptualized as a construct comprising multiple learners' internal factors that enable them to optimize the potential of the feedback process. Sutton (2012) initially proposed and defined this notion as a three-dimensional construct of teachable feedback and academic skills, and students' identity construction in an academic context. These include an understanding of the role of feedback in knowledge building, students' identity construction through feedback, and students' ability to read, interpret, and act upon feedback information. The conceptualization identifies the essential facets of SFL and the obstacles to its acquisition.

Carless and Boud (2018) further developed a process-oriented construct that includes four interrelated dimensions: appreciating feedback (students' acknowledgment of the value of feedback and their active role in the process), making a judgment (students' ability to evaluate the quality of feedback information), managing affect (students' competence in managing emotions caused by feedback), and taking actions (students' strategies to extract and apply actionable information from feedback). It was also underscored that SFL, as tacit knowledge, should be acquired through observation and repeated practice.

A learning-centered framework of SFL was developed based on large-scale empirical data from Australian university students. The framework highlights the student's role as an active seeker and provider of feedback (Molloy et al., 2020). Specifically, students should understand feedback as an active process and commit to it as an improvement. Five key competencies are essential for student proactive engagement

in feedback: eliciting, processing, generating, enacting feedback information, and acknowledging and coping with emotions.

Regardless of the conceptualizations, students' understanding, disposition, and capability regarding feedback determine their effective engagement in the feedback process (Carless & Boud, 2018). Therefore, based on the three existing frameworks, as shown in Figure 1, this study defines SFL as students' understanding of the value of feedback in improving their learning, their readiness to engage in the feedback process actively and supportively, and their capability to elicit, generate, process, and enact feedback information to improve their learning. The six-dimensional framework identifies the fundamental knowledge, attitudes, and skills and their interrelationships for effective engagement in feedback and aims to support the development of SFL.
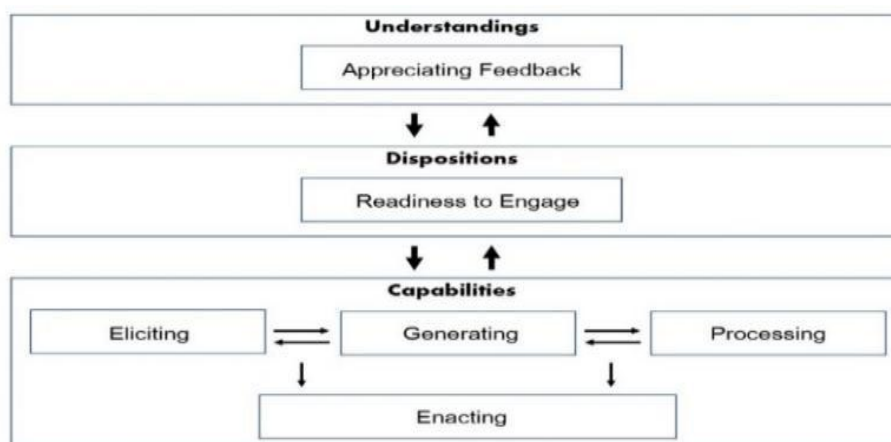

Figure 1 A Development-centered Framework of Student Feedback Literacy

Development of student feedback literacy

Since the SFL concept was proposed, a growing body of empirical research on cultivating SFL has proven the affordance of several feedback activities. Feedback training promotes an understanding of the values and skills of feedback (Tam, 2021). Self-assessment improves understanding of quality standards and is the precondition for processing and generating feedback information (Ducasse & Hill, 2019). Different types of peer feedback facilitate the development of skills in eliciting, generating, and processing feedback information (María & Annette, 2022; Zhu & Carless, 2018; Zhu & To, 2021). Teacher feedback provides a model of constructive feedback information and an in-depth understanding of quality standards (Zhan, 2019).

As different feedback activities can facilitate the development of different dimensions of SFL, the comprehensive development of all dimensions (e.g., appreciation of feedback, readiness to engage, and eliciting feedback information) requires the course design and implementation to integrate a systematically organized student-centered feedback process involving various feedback activities (Malecka et al., 2020). However, a few comprehensive feedback interventions were tested. The reflective feedback conversation, a cyclic iterative feedback process initiated by students, was proven to be effective in promoting students' uptake of teachers' comments and suggestions (Ducasse & Hill, 2019). A longitudinal study employing a systematic feedback intervention including preparatory activities, multi-source feedback, and reflective activities revealed students' perceived improvement in the five dimensions of their feedback literacy (e.g., understanding of feedback, readiness to engage, eliciting, processing, and enacting) (Zhang & Mao, 2023). The two interventions were conducted in an academic writing course for postgraduate students with a class size of 20 students, and both focused on students' capabilities as a proactive receiver of feedback information. Therefore, a comprehensive feedback intervention cultivating student feedback literacy for

being an effective receiver and provider of feedback is a necessary addition to the knowledge of student feedback literacy.

Dialogic Feedback

Influenced by the social constructivist perspective of the centrality of students and the importance of continuous and interactive dialogue in the learning process, dialogic feedback is conceptualized as a social process embedded in formative assessment to engage students in seeking and interpreting evidence of learning and to facilitate their regulation of learning process (Kleij et al., 2019). The construction of dialogic feedback integrates different feedback activities to activate interactions among multiple feedback agents (Matthews et al., 2021) and to sustain feedback loops over a course or courses in a curriculum (Carless, 2019).

In the extant models of dialogic feedback, multiple phases permit the integration of various feedback activities. The model of the Dialogic Feedback Cycle frames three stages: preparatory guidance (analysis of task requirement and quality standards), in-task guidance (teacher and peer feedback on problem-solving), and performance feedback (teacher feedback on final performance) (Beaumont et al., 2011). The four-phase model of the Dialogic Feed-forward Assessment Cycle divides the performance feedback phase into two feed-forward phases of teacher-student interaction to facilitate students' extraction and incorporation of actionable feedback information into present and future learning (Hill and West, 2020). The collaborative peer feedback framework guides students in assuming the roles of providers and receivers in three interconnected phases: social regulation in the preparatory phase, co-regulation during the in-task phase, and self-regulation in the reflection phase (Er et al., 2021).

The three essential phases in the extant dialogic feedback models have an affordance in developing different dimensions of SFL. In the pre-task phase, analyzing the task and quality standards and clarifying responsibilities promote understanding of the purpose of feedback and the student's role in feedback. The feedback-related interactions in the in-task phase enable students to observe and practice eliciting, generating, and processing feedback information. The final submission/performance phase prompts reflecting on the affordances of the feedback process in the present and the next stage of learning to enhance the recognition of feedback for improvement and the willingness to engage further in feedback.

However, it is noteworthy that the three models focus either on teacher-student dialogic feedback or on peer dialogic feedback. A model of dialogic feedback combining both types is needed to offer guidance on orchestrating the two and avoiding teacher dominance when teacher-student feedback is involved. To this end, this study proposes a framework of Collaborative Dialogic Feedback (CDF) (see Figure 2) to support the development of the six dimensions of SFL. The four-phase feedback process retains the preparatory and feed-forward phases to enhance students' appreciation of feedback and willingness to engage, but divides the in-task phase into the extended peer dialogic feedback phase and follow-up teacher-student feedback. The student-centered design aims to enhance students' recognition of internal and peer feedback effectiveness and to enable them to observe, imitate, and practice tacit feedback skills.
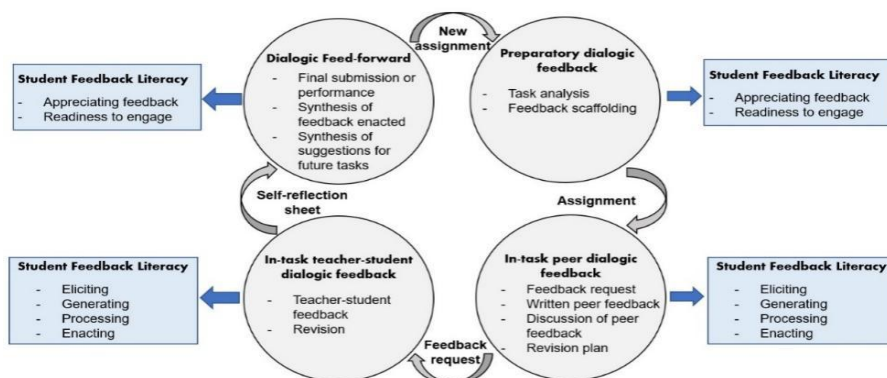

Figure 2 Collaborative Dialogic Feedback

To sum up, although the development of SFL in higher education has gained increasing attention from both scholars and educators, there is a scarcity of research on the cultivation of SFL through a systematically organized feedback intervention encompassing different feedback activities. The current study aims to fill this gap by designing, implementing, and testing a feedback intervention in a 16-week course based on the proposed CDF framework to support the development of SFL.

Conceptual Framework

To achieve the research objectives, the study conducted a quasi-experiment. The independent variable is the type of feedback process that can be directly manipulated by the researcher to vary between control and experimental groups to see how it affects the dependent variable. The independent variable includes two types of feedback processes: teacher-dominated feedback process conducted in the instruction for the control group, and collaborative dialogic feedback applied to the experimental group. The dependent variable is the six dimensions of student feedback literacy. The conceptual framework is as follows:
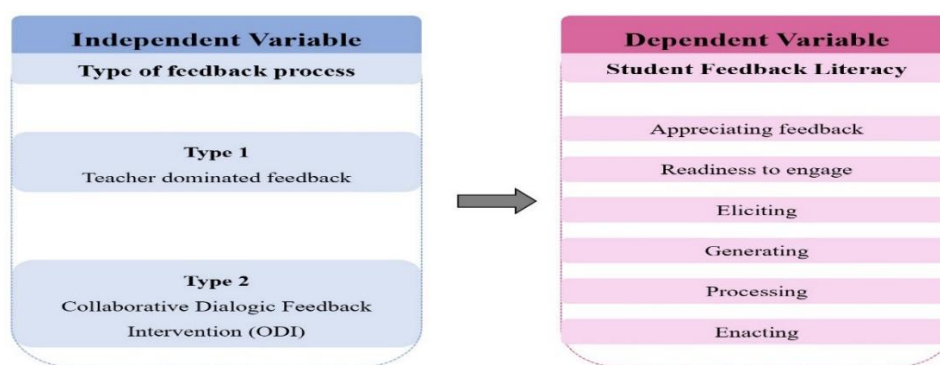

Figure 3 Conceptual Framework

From a behaviorist perspective, the type one feedback process can help students understand quality standards and improve their feedback competence by learning from the teacher's feedback. From a constructivist perspective, collaborative dialogic feedback can be more effective in achieving the same expected outcomes by enabling students to construct their understandings through proactive engagement in feedback interactions with both peer reviewers and teachers.

Methodology

Research design

The action research adopted a mixed-methods design in line with the pragmatic ontology and epistemology. As shown in Table 2, the questionnaires were administered before and after the study to assess the variations in students' perceived SFL. During the intervention, student feedback documents were collected and analyzed to reveal participants' behavioral changes in feedback competencies. After the intervention, semi-structured interviews were conducted to elucidate how and why the levels of SFL may have varied during the intervention.

To test the effects of CDF intervention, a quasi-experiment was conducted in a 16-week comprehensive English reading and writing course for two business English major classes. Throughout the three writing projects of the course, three rounds of two types of feedback processes were implemented cyclically: traditional teacher-dominated feedback for the control group, and CDF intervention for the experimental group.

Table 2 Research Design

Research Stage	Research Questions	Source of Data	Data Collection Method	Data Analysis Method
Pre-ODI	1. What are the differences in the levels of SFL between the pre- and post-feedback intervention stages?	76 students (39 + 37)	Online questionnaire	Statistical analysis: Mean, SD, independent sample t-test
	4. What is a multistage and multisource feedback framework to improve SFL?	Literature from 2010 to 2022	Literature review	Literature review
ODI	2. How did the focal students' SFL change during the feedback intervention?	9 students (experimental group)	5 types of student feedback documents collected during three writing tasks	Qualitative analysis: Content analysis
	3. Why did the focal students' SFL change during the feedback intervention?			
Post-ODI	1. What are the differences in the levels of SFL between the pre- and post-feedback intervention stages?	76 students (39 + 37)	Online questionnaire	Statistical analysis: Mean, SD, independent sample t-test, paired samples t-test, Wilcoxon singed-ranks test.
	2. How did the focal students' SFL change during the feedback intervention?	9 students (experimental group)	Semi-structured interview; Student feedback documents	Qualitative analysis: Content analysis of interview transcripts; Content analysis of student feedback documents
	3. Why did the focal students' SFL change during the feedback intervention?			
	4. What is a multistage and multisource feedback framework to improve SFL?	Synthesis of the results of above data analysis		

Population and sample

By purposive sampling, 76 undergraduates of the second-year business English cohort at a multidisciplinary university in Southwest China were selected as the research participants. The participants have been divided equally into two classes since their enrollment, based on their English proficiency levels, and the total number of each gender. Due to similar characteristics, the two classes were randomly assigned as the experimental group (N=37) and the control group (N=39).

To obtain two qualitative datasets, a stratified purposive sampling was employed, whereby nine students from the experimental group were selected based on their level of engagement during the intervention, as presented in the student feedback documents, including three highly active participants, three moderately active, and three who were less engaged.

Instruments

The student feedback literacy scale

The student feedback literacy scale was developed based on the SFL framework proposed in the study, the thirty-one features of feedback literate students in Molloy et al.'s framework (2020), and Zhan's (2022) Scale of student feedback literacy. The questionnaire contains 29 items that capture six dimensions of SLF. The first four dimensions of eliciting (5 items), generating (4 items), processing (4 items), and enacting (5 items) clarify the necessary competencies for students to seek, provide, understand, evaluate, and use feedback information. The fifth dimension of appreciation of feedback (6 items) includes students' knowledge of the value and nature of feedback. The sixth dimension of readiness to engage (5 items) represents students' willingness to assume the roles of supportive providers and proactive receivers in the feedback process. Students' responses to the questionnaire were categorized into a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Cronbach's alpha for the SLF questionnaire was 0.98.

Semi-structured individual interview

The outline of post-intervention interviews was developed to collect in-depth descriptions of students' experiences and perceptions of the influence of CDF intervention on their SFL. As shown in Table 3, the eleven questions encompass the students' experiences of changes in six dimensions of SFL during the CDF intervention, their accounts of the reasons for the changes, their perceptions of engagement in the collaborative dialogic feedback intervention, and factors influencing their engagement.

Table 3 Outline of Post-Intervention Semi-Structured Individual Interview

Questions
1. Please explain if your understanding of the purpose, and value of feedback, including peer feedback and teacher-student feedback, have changed over the course and why?
2. Please explain if your understanding of students' role in feedback have changed over the course and why?
3. Please talk about your experiences of participating a whole feedback process during one of the three writing tasks, and how the process affected your writing in the course?
4. We know that the environment of feedback activities has impact on individual's engagement with feedback. Please tell me about what characteristics of the feedback environment in the course impact your engagement and how?
5. Please tell me about what are the factors may hinder you from engage with feedback, and if there are any emotional factors involved?
6. Please tell me how the way you cope with these factors changed over the course and why?
7. Feedback activities enabled the engagement with feedback. Please tell me about what activities in the course make differences in your practices of eliciting useful information for improvement from multiple sources and how?
8. Please tell me about what differences in generating feedback information you experienced in this course and why?
9. Please tell me about what activities in the course make differences in your practices of processing feedback information for improvement and how?
10. Please tell me about what activities in the course make differences in your practices of enacting feedback information for improvement and how?
11. Are there any other changes in your using feedback that haven't been discussed or anything else you would like to talk about?

Student feedback documents

Five types of student feedback documents generated by experimental group students were collected as observational data for triangulation purposes. The dataset includes 1) students' first drafts accompanied by self-assessment annotations and requests for peer feedback; 2) written peer feedback; 3) audio recordings of the peer feedback discussion; 4) teacher feedback request forms; and 5) the final drafts with self-reflection reports. The five types of student feedback documents were generated in five feedback activities of three rounds of the CDF intervention. These documents yielded evidence of students' behaviors related to six dimensions of SFL in each activity and variations in these behaviors throughout the three rounds of CDF intervention.

Data collection

The pre- and post-intervention questionnaires were administered to all seventy-six student participants via the Wenquanxin website at the intervention's beginning and end. During the pre-intervention questionnaire, each student in the two groups randomly chose a number representing their ID to ensure their pre- and post-intervention ratings could be compared in a paired-sample t-test.

At the end of the intervention, nine focal students participated in the semi-structured individual interviews. The interviews were conducted in Chinese to allow students accurate descriptions of their experiences and perceptions. Each interview lasted thirty-five to forty-five minutes and was recorded and transcribed with the informant's consent. The total length of the recordings was about 434 minutes and 21 seconds.

Five types of student feedback documents generated by thirty-seven experimental group students were collected and filed throughout the intervention, and the nine informants' feedback documents were finally analyzed. Concerning three writing tasks, a total of 146 texts were gathered, including 27 texts for each of the following documents: first drafts, second drafts, peer feedback requests, written peer feedback, and self-reflection reports, as well as eight third drafts, and three teacher feedback requests. 27 recordings of three peer feedback discussions of nine informants, a total duration of 250 minutes 58 seconds, were also collected and transcribed.

Data analysis

The data analysis consisted of five parts (See Table 4). To safeguard the reliability and validity of the content analysis of the two qualitative datasets, three qualified coders participated in the initial coding and theme identification. The content analysis of two qualitative datasets followed an iterative deductive

and inductive approach. Based on the student feedback literacy scale of the research, typical behaviors of feedback-literate students drawn from literature, and the initial coding, the SFL-related feedback behaviors were identified. The frequency of each feedback behavior across the three rounds of intervention was compared to reveal the trajectories of behavioral variations.

Table 4 Data Analysis

Data sets	Research stages	Analysis tools	Analysis methods	Expected outputs
Student questionnaires	Pre-ODI	SPSS 2.7	Independent samples t-test, Mann-Whitney U test	- The differences in SFL between the control and experimental groups before the study
	After ODI	SPSS 2.7	Independent samples t-test, Paired sample t-tests, Wilcoxon signed-rank tests	- The differences in SFL between the control and experimental groups after the study. - The variations in SFL of the two groups across the study.
Student feedback documents	After ODI	Max QDA	Content analysis	- SFL-related feedback behaviors; - The variation trajectories of SFL-related feedback behaviors occurring in a feedback activity and across the intervention
Student individual interviews	After ODI	Max QDA	Content analysis	- SFL-related feedback behaviors; - Students' perceptions of changes in SFL; - Students' accounts of reasons for the changes during the intervention
Three datasets	After ODI		Comparison and complement	- The convergence of perceived and behavioral changes in SFL - A unified description of the SFL development during the intervention;
Two qualitative datasets	After ODI	Max QDA	Comparison and complement	- The impacts of the intervention on the SFL development.

Results

Development of student feedback literacy

The results of the pre- and post-study student questionnaire, as determined by paired-sample t-tests and Wilcoxon signed-rank tests, revealed that students from the experimental group perceived a notable enhancement in six dimensions of SFL over the three rounds of CDF intervention (see Table 5), while students from the control group reported no improvement in these dimensions after three rounds of teacher-dominated feedback (see Table 6).

Table 5 Descriptive Statistics of Pre--- and Post-intervention Questionnaires of Control Group

Dimension	Post-intervention		Pre-intervention		Paired samples t-test	
	Means	Std. Deviation	Means	Std. Deviation	t	p
Appreciation of feedback	3.49	0.51	3.49	0.56	-0.000	1.000
Readiness to Engage	3.42	0.45	3.38	0.57	0.315	0.755
Generating	3.19	0.52	3.03	0.54	1.466	0.151
Processing	3.14	0.54	3.11	0.57	0.267	0.791
Enacting	3.13	0.56	2.89	0.59	1.884	0.067
	Post-intervention		Pre-intervention		Wilcoxon Signed-Rank test	
	Median (P25, P75)		Median (P25, P75)		z	p
Eliciting	3.2 (2.8, 3.6)		3.0 (2.44, 3.6)		-0.806	0.420

Table 6 Descriptive Statistics of Pre and Post-intervention Questionnaires of Experimental Group

Variables	Median (P25, P75)		Differences of Median (Pre - Post)	Wilcoxon Signed-Rank test	
	Pre-intervention	Post-intervention		z	p
Appreciation of feedback	3.5 (3.0, 3.8)	4.3 (3.8, 4.6)	-0.8	-5.173	< 0.001
Readiness to Engage	3.4 (3.0, 3.8)	4.0 (3.8, 4.2)	-0.6	-4.871	< 0.001
Eliciting	3.0 (2.6, 3.4)	3.8 (3.4, 4.35)	-0.8	-5.022	< 0.001
Generating	3.3 (2.8, 3.5)	3.8 (3.5, 4.3)	-0.5	-4.904	< 0.001
Processing	3.0 (3.0, 3.5)	3.9 (3.5, 4.15)	-0.9	-4.946	< 0.001
Enacting	3.0 (2.4, 3.6)	3.8 (3.4, 4.2)	-0.8	-4.87	< 0.001

The following presents the variations in each dimension of SFL among students from experimental groups, which were evidenced by three datasets.

Eliciting. As shown in Table 7, students demonstrated a significant improvement in the four abilities to solicit feedback information. Firstly, students' enhanced ability to seek feedback from different sources was substantiated by increased student engagement in peer feedback interactions. Particularly, five informants (B, C, D, E, and H) reported spontaneously asking for comments and suggestions from more peers.

Table 7 Juxtaposition of Excerpt from Full Data Matrix on Eliciting

Associated survey theme	Data from questionnaire	Themes from student feedback documents	Themes from post-intervention interview (N)	Convergence label
Seeking feedback information from various sources	Higher rating on the statement "I am good at seeking feedback information from different sources" (P = 0, Z = -3.793).	*Theme*: Increasing numbers of requests in peer feedback requests and peer feedback discussion.	*Theme*: Increasing efforts to seek peers' comments and suggestions. (13)	Confirmed
Eliciting through communication	Higher rating on the statement "I am good at communicating with others to elicit useful information about what is good work or performance" (P = .001, Z = -3.301).	*Theme 1*: Seeking supports based on careful self-assessment. *Theme 2*: Spontaneously asking for further clarifications and supports in peer feedback discussion and teacher feedback request.	*Theme 1*: Initiating communication by identifying problems and clarifying needs for supports. (12) *Theme 2*: Spontaneously asking for further clarifications and supports. (16)	Confirmed and complemented
	No higher rating on the statement "I am good at communicating with others to seek useful information to solve problems I encounter in learning" (P = .35, t = 2.189).	*Theme*: Asking for confirmation or further suggestions from teacher regarding solutions that were concluded in the peer feedback phase.	*Theme*: Extra efforts in communication for a feasible solution. (7)	Contradictory and complemented
Eliciting through referencing learning materials	Higher rating on the statement "I am good at accurately interpreting the standards of work or performance by seeking out criteria and exemplars" (P = 0, Z = -3.522).	*Theme 1*: Increasing accuracy in using criteria during self-assessment and peer feedback. *Theme 2*: Improvement in using the criteria as guidance in revisions and evaluation.	*Theme 1*: Accurate understandings of criteria. (13) *Theme 2*: Improvement in using the criteria as guidance in revisions and evaluation. (8)	Confirmed and complemented
Eliciting through observing peers	Higher rating on the statement "I am good at observing others to eliciting useful information to improve my own learning" (P = 0.002, t = 3.412).	*Theme 1*: Identifying common problems in peer feedback discussions. *Theme 2*: Commenting on peer's strengths in written peer feedback.	*Theme 1*: Identifying common problems through observation. (15) *Theme 2*: Identifying peer's strengths through observation. (2)	Confirmed and complemented

Secondly, four types of behavioral changes corroborated students' improvement in eliciting feedback information through communication. Across the three rounds of peer feedback requests, discussions, and teacher feedback requests, students demonstrated continuous progress in inquiring about specific problems and detailing the requests. All informants reported consciously initiating feedback communication based on careful self-assessment. Six (B, C, D, E, F, and H) recalled their spontaneous requests for further clarification and support. Despite perceptions of lingering difficulties in obtaining feasible solutions, students increasingly resorted to communication with more feedback agents to elicit actionable solutions. Thirdly, students' better understanding and use of quality standards evidenced their perceived improvement in extracting useful information from learning materials. These included enhanced accuracy in relating

specific problems to criteria, an increase in justifying comments by quoting criteria, and more frequent use of the criteria as guidance in writing.

Fourthly, there was a moderate increase in students' ability to elicit helpful information by observing peers' performance. In the interview, all informants noted their growing attention to co-editing online teacher feedback request forms to identify ignored common problems. Seven (except for E and H) reported that composing peer feedback prompted recognition of overlooked problems and appreciation of peers' strengths.

Generating. Students' enhancement in generating constructive feedback information was confirmed across the three datasets (see Table 8). Firstly, during the intervention, students demonstrated an increasing ability to diagnose problems accurately based on a better understanding of the relevant criteria.

Secondly, students consciously developed the capacity to comment on specific problems with well-reasoned justifications and propose solutions with comprehensive explanations. Notably, seven informants (except for H and G) reported that after recognizing that sufficiently justified feedback information can help fix problems, they were inclined to elaborate on their comments and suggestions in detail. Thirdly, eight informants (except for E) demonstrated consistent willingness and efforts to avoid offending others in feedback by composing and delivering polite comments.

Table 8 Juxtaposition of Excerpt from Full Data Matrix on Generating

Associated survey theme	Data from questionnaire	Themes from student feedback documents	Themes from post-intervention interview (N)	Data convergence label
Accurately identifying areas need to be improved	Higher rating on the statement "I am good at identifying the areas need to be improved in others' work or performance against the criteria" (P = 0.011, Z = -2.539).	*Theme:* Increasing accuracy in identifying areas need to be improved in self-assessment and peer feedback.	*Theme:* Increasing accuracy in identifying areas need to be improved. (12)	Confirmed
Justifying comments	Higher rating on the statement "I am good at clarifying the reasons why the areas need to be improved" (P = 0.01, Z = -2.589).	*Theme:* Increasing numbers of comments on specific issues with sufficient justification in self-assessment, peer feedback and self-reflections.	*Theme:* Improvement in commenting on specific issues with sufficient justification. (12)	Confirmed
Making specific suggestions	Higher rating on the statement "I am good at making specific suggestions for improvement" (P = 0, Z = -4.249).	*Theme:* Increasing numbers of suggestions on specific issues with sufficient justification in self-assessment, peer feedback and self-reflections.	*Theme:* Improvement in elaborating solutions to specific issues in detail. (15)	Confirmed
Avoiding offending others	Higher rating on the statement "I am good at refining the way I make comments and suggestions to avoid offending others" (P = 0.012, Z = -2.517).	*Theme:* A slight increase in numbers of polite comments in peer feedback. Consistent efforts in avoiding offending others.	*Theme:* Increasing conscious efforts in avoiding offending others. (4)	Confirmed

Processing. Table 9 illustrates the varied changes in the four competencies regarding processing feedback information. On the one hand, there was a notable improvement in students' ability to acknowledge different perspectives and extract actionable information. Seven informants (except for B and G) reported an increase in appreciating and spontaneously seeking different perspectives from peers. Seven informants (except for F and I) recalled formulating solutions by careful analysis of feedback information from peers and the teacher.

Table 9 Juxtaposition of Excerpt from Full Data Matrix on Processing

Associated survey theme	Data from questionnaire	Themes from student feedback documents	Themes from post-intervention interview (N)	Convergence label
Comprehending the feedback information received	No higher rating on the statement "I am good at comprehending others' comments on my work and performance" ($P = 0.298$, $Z = -1.041$).	*Theme*: Discussions on accurate comprehending written peer feedback information.	*Theme 1*: Difficulties in comprehending written feedback information. (7) *Theme 2*: Better comprehension of feedback information due to detailed interpretation. (15)	Mixed
Judging the quality of the feedback information received	No higher rating on the statement "I am good at judging the quality of others' comments on my work or performance" ($P = 0.174$, $Z = -1.358$).	*Theme*: Few comments on the quality of peer feedback information in peer feedback discussion.	*Theme*: Extra efforts for assessing the quality of peer feedback information. (4)	Confirmed
Recognizing different perspectives	Higher rating on the statement "I am good at recognizing different standing points of other people when they give comments on my work or performance" ($P = 0.005$, $Z = -2.805$).	*Theme*: Few cases of explicitly acknowledging different perspectives in peer feedback discussion.	*Theme*: Increasingly Appreciating different perspectives. (7)	Confirmed
Extracting actionable information	Higher rating on the statement "I am good at extracting key actionable information from the feedback interactions" ($P = 0.001$, $Z = -3.417$).	*Theme 1*: Increasing numbers of summaries of solutions in peer feedback discussion. *Theme 2*: Improvement in quality of summaries of suggestions adopted in self-reflections.	*Theme*: Improvement in extracting actionable information. (18)	Confirmed

On the other hand, persistent challenges were reported and observed in comprehending and evaluating the feedback information. However, communication was reported as an effective way to mitigate misunderstandings and misjudgments. Specifically, seven informants (except for G) considered that peer discussion enabled their better understanding. Six informants (except for A, B, and F) reported seeking confirmation from different feedback sources. This contradiction indicated that although the challenges were significant, students were acquiring the ability to conquer them.

Enacting. The three datasets consistently demonstrated a significant enhancement in the uptake of feedback information for improvement (see Table 10). To improve the quality of the current writing, students (except for H and I) proactively finished three drafts by utilizing solutions from teachers, peers, and self-assessments and seeking more examples from the internet (C, E, F, H, and I). To maximize the effect of feedback on continuous improvement, as seven informants (except for H and I) recalled, they consciously synthesized and continuously addressed the recurring problems by implementing solutions and strategies accumulated in the previous feedback processes.

Table 10 Juxtaposition of Excerpt from Full Data Matrix on Enacting

Associated survey theme	Data from questionnaire	Themes from student feedback documents	Themes from post-intervention interview (*N*)	Data convergence label
Implementing feedback information to improve the quality of current work	Higher rating on the statement "I am good at translating actionable plan extracted from feedback into my action" (P = 0.024, Z = -2.252).	*Theme*: Incorporating feedback information from multiple feedback agents in revisions.	*Theme*: Multiple drafts during the feedback process. (7)	Confirmed
	Higher rating on the statement "I am good at finding additional learning resources to finish the suggested revision" (P = 0.019, Z = -2.346).	*Theme*: Obtaining more examples and interpretations from the internet or other peers to improve their revisions.	*Theme*: Making full use of textbook, and online resources. (8)	Confirmed
Incorporating feedback information into future learning	Higher rating on the statement "I am good at adjusting or setting goals for my later learning based on the information I collected in feedback process" (P = 0, Z = -2.083).	*Theme*: Increasing focus on solving complicated problems in self-reflections reports.	*Theme*: Summarizing recurring problems and solutions for future writing. (16)	Confirmed
	Higher rating on the statement "I am good at changing my learning strategies on the basis of the information I collected in feedback" (P = 0.006, Z = -2.722).	*Theme*: Consistent efforts in synthesizing and using learning strategies obtained from feedback.	*Theme*: Conscious use of newly learned strategies. (7)	Confirmed
	Higher rating on the statement "I am good at monitoring my own progress to see if I can make good use of feedback to improve my learning" (P = 0, Z = -3.574).	*Theme*: Increasing attentions on recurring problems in self-reflection reports and self-assessment.	*Theme*: Reviewing summaries and solutions of recurring problems before new tasks. (8)	Confirmed and complemented

Readiness to engage. Drawing upon students' accounts and practices, students could have assumed the roles of proactive receivers and responsible providers of feedback information. As proactive receivers, students consistently sought and incorporated feedback information from different feedback agents to improve their writing quality and increasingly focused on addressing problems, especially recurring problems (see Table 11). Despite the persistent influence of feelings of defensiveness, eight informants (except for A) took the initiative to overcome such negative feelings by focusing on problem-solving and further communicating with peers.

As responsible providers, students reported a growing willingness to provide constructive feedback while acquiring such an ability during the intervention (see Table 11). Furthermore, students' strengthened willingness to trust peers was evidenced by their heightened involvement in peer feedback interactions (all informants) and their spontaneous efforts to facilitate their peers' engagement (informants A, B, C, G, and H).

Table 11 The juxtaposition of Excerpt from Full Data Matrix on Readiness to Engage

Associated survey theme	Data from questionnaire	Themes from student feedback documents	Themes from post-intervention interview (N)	Convergence label
Engaging as a proactive receiver	Higher rating on the statement "I am ready to open my mind to receive comments from different sources (e.g., teachers, peers, or school mentors)" (P = 0.012, Z = -2.515).	*Theme*: Consistently utilizing feedback information from self-assessment, peers and teacher.	*Theme*: Expanding source of feedback information. (14)	Confirmed
	No higher rating on the statement "I am ready to accept the criticism on the quality of my work or performance without defensiveness" (P = 0.085, Z = -1.722).	*Theme 1*: Efforts for overcoming negative feelings. *Theme 2*: Decreasing negative emotions and increasing positive emotions.	*Theme*: Consciously recognizing and overcoming defensiveness. (5)	Mixed
	Higher rating on the statement "I am ready to conquer the difficulties I encounter in the revision process" (P = 0.024, Z = -2.252).	*Theme 1*: Increasing summaries of useful solutions and learning strategies in self-reflection reports. *Theme 2*: Spontaneously finishing multiple drafts. *Theme 3*: Increasing attention on recurring problems.	*Theme 1*: Increasing attention on problem-solving. (9) *Theme 2*: Addressing recurring problems and overcoming feelings of frustration. (8)	Confirmed
Engaging as a responsible provider	Higher rating on the statement "I am ready to build trust with others to facilitate continuous dialogue" (P = 0.021, Z = -2.307).	*Theme*: Increasing engagement in peer feedback.	*Theme 1*: Increasing engagement in peer feedback. (13) *Theme 2*: Efforts in facilitating continuous feedback process. (8)	Confirmed
	Higher rating on the statement "I am ready to honestly exchange meaningful information about comments on others' work or performance" (P = 0.001, Z = -3.254).	*Theme*: Increasing numbers of constructive comments and suggestions.	*Theme*: Increasing efforts in providing constructive comments and suggestions. (9)	Confirmed

Appreciation of feedback. Regarding perceptions of the four values of feedback, the students reported and exhibited varied variations. As shown in Table 12, while increasingly recognizing that feedback provides different perspectives to support self-evaluation, students did not increasingly perceive the positive impact of feedback on accurate self-assessment or effective self-reflection. However, nine informants demonstrated increased initiative in enhancing the quality of self-assessment and self-reflection reports. All informants believed careful self-assessment was the precondition of effective feedback and reported their conscious review of the self-reflection report from the previous task before commencing a new task. Their experiences evidenced a growing recognition of the value of feedback in supporting self-evaluation and self-reflection.

Table 12 Juxtaposition of Excerpt from Full Data Matrix on Appreciation of Feedback

Associated survey theme	Data from questionnaire	Themes from student feedback documents	Themes from post-intervention interview (N)	Convergence label
Recognizing the value of feedback in facilitating self-evaluation	No higher rating on the statement "I have realized that feedback process can make me recognize my learning strengths and weaknesses" (P = 0.074, Z = -1.788).	*Theme 1*: Improvement in careful self-assessment.	*Theme 1*: Recognition of self-assessment as the base for feedback. (9) *Theme 2*: Recognition of feedback facilitating self-evaluation calibration. (13)	Contradict and complemented
	Higher rating on the statement "I have realized that feedback process can provide me a chance to look at my work or performance from different perspectives" (P = 0.001, Z = -3.370).	*Theme*: Revisions based on suggestions from self-assessment, peer feedback and teacher feedback.	*Theme*: Recognition of feedback providing different perspectives. (9)	Confirmed
Recognizing the value of feedback in facilitating self-reflection	No higher rating on the statement "I have realized that feedback process can enhance my self-reflection on how I can systematically improve my learning" (P = 0.499, Z = -0.676).	*Theme*: Improvement in synthesizing revisions and feedback information.	*Theme 1*: Increasing recognition of the value of self-reflection. (9) *Theme 2*: Improvement in conscious and careful self-reflection. (11)	Contradict and complemented
Recognizing the value of feedback in facilitating genuine communication	Higher rating on the statement "I have realized that feedback process can encourage me to engage in genuine communications with others" (P = 0.002, t = 3.431).	*Theme 1*: Improvement in quality of requests for feedback. *Theme 2*: Improvement in maintaining feedback interactions. *Theme 3*: Improvement in providing constructive feedback information.	*Theme 1*: Improvement in initiating communication with a clear goal. (12) *Theme 2*: Improvement in maintaining feedback interactions. (17) *Theme 3*: Improvement in providing meaningful information. (17)	Confirmed and complemented
Recognizing the value of feedback in facilitating continuous improvement	Higher rating on the statement "I have realized that feedback process can promote my understanding that expertise is not fixed but can evolve over time" (P = 0.008, Z = -2.635).	*Theme*: Increasing attention on complicated unsolved problems.	*Theme*: Conscious utilization of useful feedback information. (17)	Confirmed and complemented
	Higher rating on the statement "I have realized that feedback process can enable me to improve my learning continually" (P = 0.014, Z = -2.465).	*Theme*: Accumulating different solutions to recurring problems.	*Theme*: Growing perception of improvement. (18)	Confirmed and complemented

As illustrated in Table 12, students' enhanced recognition of feedback for promoting engagement in genuine communications was evidenced by their growing awareness of their responsibility for effective communication and their conscious application of communication skills during the feedback interactions. All informants also attributed such variations to their improved ability to elicit feedback through communication and generate constructive feedback. Meanwhile, eight informants (except for H) noted that their growth in enacting feedback information and reflecting the learning process promoted their perception that feedback enables continuous improvement. The students' experiences and accounts demonstrated a reciprocal relationship between their enhanced appreciation of feedback and their improved feedback competencies.

Reasons for the development of SFL during the CDF intervention

As shown in Table 13, the students attributed their development of SFL to the CDF intervention in the interviews, and their attribution was evidenced by their behavioral changes observed in student feedback documents. While students viewed all the feedback activities of the CDF intervention as beneficial, they consensually underscored three factors: the availability of guidance and models for feedback skills, the provision of abundant opportunities to practice, and first-hand experiences of the value of feedback.

Table 13 The influences of CDF intervention on the Development of SFL

Phases of CDF	Activities of CDF	Theme from post-intervention interview (n)	Theme from student feedback documents
Preparatory dialogic feedback	Task analysis	– Guidance for eliciting feedback. (4)	
	Feedback scaffolding	– Guidance for eliciting feedback. (6) – Guidance for generating feedback. (7) – Guidance for processing feedback. (4) – Guidance for being a proactive receiver. (16) – Guidance for being a responsible provider. (10) – Enhancing recognition of values of feedback. (5)	
In-task peer dialogic feedback	Peer feedback request	– Practicing eliciting feedback. (14) – Practicing generating feedback. (10) – Encouraging enacting feedback. (5) – Practicing being a proactive receiver. (10) – Enhancing recognition of values of feedback. (6)	– Improvement in eliciting feedback. (5) – Improvement in Self-assessment. – Revising problems identified in self-assessment. – Consciously initiating feedback interaction. – Increasing engagement in feedback. (4)
	Written peer feedback	– Practicing eliciting feedback. (15) – Practicing generating feedback. (9) – Encouraging enacting feedback. (5) – Practicing being a responsible provider. (7) – Enhancing recognition of values of feedback. (2)	– Eliciting feedback information by observing. (2) – Improvement in quality of peer feedback. (4) – Adopting and summarizing peer feedback. (2) – Improvement in quality of feedback. (2) – Increasing engagement in interactions and self-assessment. (2)
	Peer feedback discussion	– Practicing eliciting feedback. (26) – Practicing generating feedback. (11) – Practicing processing feedback. (18) – Encouraging enacting feedback. (5) – Practicing being a proactive receiver. (11) – Practicing being a responsible provider. (8) – Enhancing recognition of values of feedback. (10)	– Improvement in eliciting feedback. (6) – Improvement in quality of peer feedback. (4) – Improvement in processing feedback. (5) – Supporting enacting feedback information. (3) – Improvement in quality of requests and feedback. (3) – Acknowledging and appreciating different perspectives. – Improvement in synthesizing useful information.
In-task teacher dialogic feedback	Teacher feedback request	– Practicing eliciting feedback. (19) – Encouraging enacting feedback. (6) – Practicing being a proactive receiver. (10) – Enhancing recognition of values of feedback. (7)	– Improvement in initiative and quality of requests. (3) – Requesting for solutions to unsolved problems. – Initiating feedback interaction. – Increasing engagement in feedback. (4)
	Teacher-student feedback	– Models for eliciting feedback. (11) – Models for generating feedback. (11) – Models for processing feedback. (16) – Models for enacting feedback. (6) – Encouraging enacting feedback. (6) – Models for being a responsible provider. (2) – Enhancing recognition of values of feedback. (6)	– Adopting and synthesizing teacher feedback.
Dialogic feed-forward	Revision	– Practicing enacting feedback. (10) – Practicing being a proactive receiver. (3)	– Improvement in quality of revisions. (3) – Careful revisions based on feedback from various sources. (2)
	Self-reflection report	– Encouraging eliciting feedback. (3) – Practicing generating feedback. (1) – Practicing processing feedback. (12) – Practicing enacting feedback. (19) – Practicing being a proactive receiver. (10) – Enhancing recognition of values of feedback. (4)	– Synthesizing useful feedback information. – Elaboration on useful suggestions. – Synthesizing useful feedback information. – Synthesizing useful feedback information. – Recognizing positive feelings – Focusing on problem-solving – Addressing recuring problems. – Synthesizing useful information. – Conscious self-reflection. – Focusing on problem-solving. – Growing perception of improvement.

Firstly, students reported recognition of the teacher as a primary source of guidance on effective feedback practices and a model to emulate in developing their feedback competencies, rather than the only

source of authoritative feedback information. On the one hand, seven informants (except for A and B) found that the extended dialogic peer feedback phase preceding the teacher feedback phase enabled them to appreciate the value of peer feedback and reduced their reliance on the teacher. Informant A reported, "After receiving the teacher's feedback, I realized that my peer reviewer had made similar comments and suggestions, but I ignored them. Since then, I have attentively read peer feedback."

On the other hand, students perceived the importance of teacher support in their SFL development. As most problems were solved during the peer feedback phase, "the teacher analyzed the problems in detail and elaborated on the rationale of judgment and steps to address them" (Informant D). Therefore, students learned "how the criteria are related to the examples in the textbook and the problems in students' essays" (Informant A). Furthermore, students commented that the four feedback scaffolding sessions assisted them in understanding feedback as an interactive process for improvement (all informants) and acquiring methods for eliciting useful feedback information (informants B, C, D, E, F, and I), formulating constructive feedback information (all informants), and managing negative emotions (informants B, C, D, E, G, H, and I). Informant I resolved a heated argument with her peer reviewer by employing newly acquired feedback skills.

After the argument, I recalled the discussion about offering detailed elaboration on comments and suggestions to guarantee objectivity and to avoid offending the recipients in the third feedback scaffolding. I realized my resistance to criticism and thought that constructive feedback information may reduce my negative feelings. Then, my partner and I agreed to provide clear and detailed explanations in future feedback processes to prevent misunderstandings.

It can be concluded that CDF intervention enabled students to gradually make full use of various sources of feedback for their knowledge construction, and provided sustained teacher support for students' conscious development of SFL.

Secondly, students attributed their spiral of progress in SFL to the ongoing practice in the CDF intervention. A series of feedback activities of the CDF intervention positioned students as the key feedback agents in a continuous dialogue on improvement. In the interview, all informants recalled that they initiated the feedback interactions by requesting peer feedback based on their self-assessment; they commented peer's essays, corroborated their self-assessment, and further interpreted comments generated by themselves or their peers in the written peer feedback and discussion; to sustain their construction of understanding, they required the teacher to analyze unsolved common problems identified by themselves; finally, in the feed-forward phase, they reviewed and synthesized their own and peer reviewers' comments for improvement in present essay and future learning.

In such a student-directed dialogue, students' shifting roles of reviewers and reviewers enabled them to continuously practice, observe, reflect, and refine their feedback skills and make gradual progress. Therefore, except for the preparatory dialogic feedback, students related all three phases of the CDF to the practice of feedback skills. Furthermore, the behavioral illustrations of these skills were observed in all five types of student feedback documents generated throughout the three rounds of the CDF intervention.

Thirdly, the difficulties and benefits of constructing understandings and solutions through the feedback interactions enhanced students' understanding of the value of feedback and encouraged them to assume active roles in feedback. As the extended feedback interactions with both peers and the teacher preceded the final submission, the students proactively engaged in the feedback process to enhance the quality of their essays. Such engagement was evidenced by the fact that all informants exhibited an increasing involvement in peer feedback interactions and that eight informants spontaneously completed three drafts in Task three.

Concurrently, students noted that the self-reflection report enhanced their perception and motivation for improvement in learning and SFL. Informant D, for instance, best exemplified such improvement.

When synthesizing the major problems and useful corresponding solutions in self-reflection, I felt a sense of fulfillment because I could recognize the problems. However, in the self-assessment of the next writing, I felt frustrated because I found similar problems again. In the following revision and writing, I

will consciously require myself to avoid this type of problem and to correct it whenever I recognize it. After several times of such practice, I may feel that I can overcome it. The self-reflection prompted me to deal with the problem.

These two formative and feed-forward designs in the intervention promoted students' recognition of the interconnections between their engagement in feedback and continuous improvement. Additionally, they were encouraged to focus on the learning process and to engage further with feedback to cultivate their own SFL.

Discussion

The quasi-experimental research yielded findings that address the four research objectives of the study. For research objective one, the findings from three datasets indicate that students from the experimental group exhibited significant progress in all six dimensions of SFL throughout the CDF intervention. Statistically, the medians of each dimension in the post-intervention survey exceed those in the pre-intervention survey by 0.9 to 0.5 points, with p-values less than 0.001. The perceived significant enhancement in focal students' SFL was corroborated and complemented by the behavioral developmental trajectories derived from the student feedback documents and the interviews. The overall improvement in all six dimensions of focal students across the course supports Carless & Boud's (2018) claims that SFL is dynamic and can be developed over time.

In terms of the process of change in SFL, research objective two, the variations in SFL-related behaviors observed in student feedback documents and reported in interviews are characterized as interrelated, gradual, and unbalanced. The interrelated development was evidenced by two findings. Firstly, the results from two qualitative datasets demonstrate that a single feedback activity can foster the improvement of multiple dimensions of feedback literacy. Secondly, in the interviews, students frequently commented on the improvement of one dimension as a precondition for the others. This provides empirical evidence for Carless and Boud's (2018) two propositions that the dimensions of SFL are interrelated and that the interrelated dimensions of SFL necessitate the reasonable orchestration of various feedback activities in the feedback intervention design.

The gradual and unbalanced development was substantiated by the spiral progress in behavior observed in student feedback documents and recurrent frustration reported in interviews. These findings echo the results of Han and Xu's (2019) and Ying's (2022) studies that a student may attain varied levels of feedback literacy across different dimensions and over time, and such uneven development can be attributed to both personal and contextual factors. This necessitates the integration of the feedback process into the curriculum to ensure the cumulative and progressive development of SFL (Carless & Boud, 2018). Concerning the fourth objective, the findings of the study demonstrated that the four designs of CDF intervention effectively promoted the comprehensive development of SFL by providing sustained teacher guidance for acquiring feedback skills, abundant opportunities to practice, and first-hand experiences of the value of feedback. The four designs are the student-centered design, continuous dialogue, future orientation, and sustained support.

CDF intervention adopted two student-centered approaches: peer feedback precedes teacher-student feedback (To and Liu, 2018), and students initiate and direct the feedback interaction (Esterhazy & Damşa, 2019). Specifically, a three-step in-task peer dialogic feedback precedes a two-step in-task teacher-student dialogic feedback, and both phases start with and revolve around students' feedback requests. The results of the two qualitative datasets revealed that the design encouraged students to apply the newly learned feedback skills and to recognize the benefits of their changes. The results support Malecka et al.'s (2020) proposal that the student-centered design of the feedback process should be followed to enable sustained practices and progressive improvement in SFL.

The CDF intervention sustained the continuous dialogues on improvement through written and oral feedback interactions among peers and between teachers and students. The study results demonstrated that such dialogues provided opportunities for the practice of feedback skills, as well as opportunities to observe,

inquire, evaluate, and imitate others' feedback practices. The results substantiated the assertion that student feedback literacy, a tacit form of knowledge, could only be acquired through co-construction in a dialogic process (Reddy et al., 2020; Zhu & To, 2021).

The feed-forward design of the CDF intervention aims to encourage students to reflect on how the dialogic feedback process facilitates their learning and their development of SFL. The findings from the two qualitative datasets revealed that students' conscious reflections enabled the reinforcement of their feedback skills and the recognition of the value of feedback for continuous improvement, and consequently fostered their further engagement in CDF. This echoed the findings of Kleijn (2021) that to foster students' motivation to spontaneously develop SFL, students need to experience the affordance of feedback on continuous improvement in learning.

The CDF intervention integrated sustained feedback scaffolding to equip students with feedback skills and transformed teacher feedback as models for such skills. Students reported the affordance of the four scaffoldings and their conscious emulation of the teacher model during the intervention. The results highlighted the significance of proper guidance for facilitating students' recognition and mastery of feedback skills (Wood, 2021).

Based on the above discussions that the CDF intervention supported focal students' gradual improvement in all six dimensions of SFL, and the fifth research objective is achieved. The preliminary proposal of the CDF framework (see Figure 2) could be supported after adjustment. Firstly, students' appreciation of and readiness to engage in feedback was gradually constructed and strengthened as a result of their positive experiences throughout the whole feedback process, rather than teacher support in the preparatory phase or the required self-reflection in the final feed-forward phase. Secondly, the preparatory phase also supported the development of the four feedback competencies by providing relevant knowledge and training. Thirdly, in the fourth phase, while completing the final revision and synthesizing useful feedback, students also practiced the skills of generating, processing, and enacting. Therefore, the framework of Collaborative Dialogic Feedback for the Development of Student Feedback Literacy should be modified as in Figure 3:
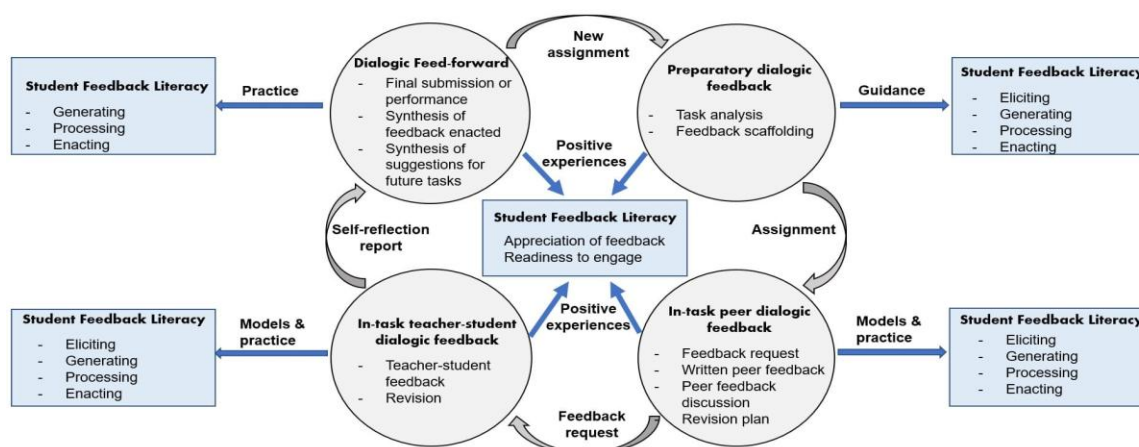

Figure 3 Collaborative Dialogic Feedback

Conclusion

Through a mixed-methods study involving a quasi-experimental design, the results evidence that the CDF intervention, based on three existing models of dialogic feedback, has the potential to support the development of six dimensions of SFL. The framework of CDF, validated through action research, provides insights into the integration of systematically organized feedback processes into higher education curricula and instructional practice.

The results of the study increase our knowledge of the six interrelated dimensions of SFL necessary for students to maximize the benefits of feedback by playing the crucial agent role as both proactive receivers and responsible providers in a feedback process. The construct of SFL can facilitate university teachers to systematically inquire about student feedback literacy and modify their feedback practices accordingly. Furthermore, the study identifies the requisite feedback activities and the principle of orchestration of these activities to support the development of SFL. Accordingly, it provides pedagogical guidance for instructors to devise and implement different feedback activities in the instruction and curriculum of undergraduate education, particularly in higher education institutions in China. The proposal of the CDF framework can bridge the gap of a scarcity of empirical research on the cultivation of overall dimensions of SFL with an integrative feedback intervention.

Recommendation

The research has found that SFL can be cultivated through a consciously and systematically designed CDF intervention. The results indicate that instructors and higher education institutions could utilize the CDF framework to guide the integration of the feedback process into the curriculum. In light of these findings, the following recommendations are worthy of consideration. Firstly, as the change in the six dimensions of SFL can be perceived by students and measured by teachers, the meticulous monitoring of SFL development can enhance students' confidence in honing their feedback skills and enable teachers to design and refine feedback practices. Secondly, the interrelated, unbalanced, and gradual development of SFL necessitates the cyclical implementation of CDF intervention integrated into several related formative assessments across one or several courses. Thirdly, the effective integration of four designs into a feedback process requires instructors to consciously design the assessment tasks by teaching objectives and select, order, and embed appropriate feedback activities into the different stages of each assessment task, guided by the CDF framework. Fourthly, as evidenced in the preliminary investigation, the traditional concepts of feedback held by many teachers may impede the implementation of the student-centered feedback process. Therefore, it is imperative that teachers receive training, participate in workshops, and engage in research on student-centered feedback, such as CDF, to update their educational concepts and teaching methods.

Despite the practical implications, the current study has limitations that should be acknowledged. First, the generalization of some of the findings from this study should be drawn with caution due to the lack of longitudinal data and the limited scope of a case study of a single university with a small sample size. The development of multiple feedback literacy's various dimensions can occur at different rates or in sequence, so it is recommended that students be provided with opportunities to practice in various settings over time (Malecka et al., 2020). Therefore, whether a more extended intervention period will yield any differences remains unknown.

The study may not demonstrate the influence of the greater context beyond the classroom of a course. SFL is shaped by both the classroom's immediate context and the university's larger context. However, the larger context is not a manageable setting for the initial stage of action research. Therefore, future studies will be needed to expand the research scope and investigate the influence of a larger context on the development of student feedback literacy.

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